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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/696,619	10/25/2000	Tetsuo Tsutsui	SEL 220	3946

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EXAMINER	
COLON, GERMAN	

ART UNIT	PAPER NUMBER
2879	

DATE MAILED: 03/31/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/696,619	TSUTSUI ET AL.	
	Examiner	Art Unit	
	German Colón	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *21 January 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *01/21/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's Arguments, filed on January 21, 2004, has been entered and acknowledged by the Examiner.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Antoniadis et al. (US 6,366,017) in view of Onitsuka et al. (US 6,049,167).

Regarding claim 1, Antoniadis discloses a light-emitting device comprising: an opaque electrode **12** over a substrate **10**; an EL layer **16** over the opaque electrode; and a transparent electrode **20** over the EL layer; wherein each of said EL layer **16** and said transparent electrode **20** has a film thickness in which there is no occurrence of a guided light. Antoniadis fails to disclose "an inert gas filled in a space between the transparent electrode and a cover material".

However, in the same field of endeavor, Onitsuka discloses an EL device comprising an EL layer being sandwiched between a transparent electrode and an opaque electrode, where an inert gas fills a space between the transparent electrode and a cover material, with the purpose of avoiding the presence of moisture that can cause separation between the EL layer and the electrode layers or degradation of the constituent materials, generating dark spots or failing to

maintain light emission (see Col. 1, lines 27-32). Therefore, it would have been obvious to anyone of ordinary skill in the art at the time the invention was made to use Onitsuka's teachings to improve the EL device of Antoniadis, in order to avoid moisture that can cause separation of the EL and electrodes layers or degradation of the constituent materials, generating dark spots or failing to maintain light emission. Antoniadis-Onitsuka discloses a light generated in said EL layer being emitted to the cover material side.

Regarding claim 2, Antoniadis-Onitsuka discloses an EL device wherein the thickness (d) of the EL layer and transparent electrode satisfies a formula $d \leq \lambda/(4n)$ when a light with a wavelength "λ" generated by the EL layer passes through a medium with a refractive index "n". The Examiner notes that the claim does not make reference to a particular wavelength; accordingly, any wavelength can exemplify the claimed wavelength. Antoniadis-Onitsuka teaches the EL layer made of either Alq3 [n=1.7] (see '017, Col. 3, lines 21-24) and the transparent electrode made of ITO [n=1.95] (see '017, Col. 3, line 55 and Col. 4, line 12). The preferred thickness of the EL layer is 100 nm (see '017, Col. 5, line 55) and that of the transparent electrode ranges from 1-50 nm (see '017, Col. 3, lines 55-57). The disclosed thickness values satisfy the claimed thickness equation (where $d \leq 103$ nm for Alq3 and $d \leq 90$ nm for ITO, for a wavelength in the red spectrum of 700 nm).

Referring to claim 3, Antoniadis-Onitsuka discloses a light-emitting device comprising see Fig. 1 of US '017): an opaque electrode **12** over a substrate **10**; an EL layer **16** over the opaque electrode, said EL layer having a light-emitting material; a transparent electrode **20** over the EL layer; an inner gas filled in a space between the transparent electrode and a cover material (see US '017 in view US '167, Col. 1, lines 27-32); and a buffer layer **18** (or **14**) provided

between said light-emitting layer and said transparent electrode or between said light-emitting layer and said opaque electrode; wherein each of said EL layer **16** and said transparent electrode **20** has a film thickness in which there is no occurrence of a guided light. Same reasons for combining stated in claim 1 apply.

Referring to claim 4, claim 4 is rejected over the reasons stated in the rejection of claim 2 above.

4. Claims 5-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al. (US 6,147,451) in view of Onitsuka et al. (US 6,049,167), further in view of Codama (US 6,091,078) and Arai (US 6,163,110).

Regarding claim 5, Shibata discloses a light-emitting device having a pixel portion comprising a semiconductor device and an EL element electrically connected to the semiconductor device formed on a substrate (see Fig. 5 and Col. 3, lines 33-38), said EL element comprising:

an opaque electrode **22**; an EL layer **23** over the opaque electrode; and a transparent electrode **24** over the EL layer. Shibata fails to disclose "an inert gas filled in a space between the transparent electrode and a cover material".

However, in the same field of endeavor, Onitsuka discloses an EL device comprising an EL layer being sandwiched between a transparent electrode and an opaque electrode, where an inert gas fills a space between the transparent electrode and a cover material, with the purpose of avoiding the presence of moisture that can cause separation between the EL layer and the electrode layers or degradation of the constituent materials, generating dark spots or failing to

maintain light emission (see Col. 1, lines 27-32). Therefore, it would have been obvious to anyone of ordinary skill in the art at the time the invention was made to use Onitsuka's teachings to improve the EL device of Shibata, in order to avoid moisture that can cause separation of the EL and electrodes layers or degradation of the constituent materials, generating dark spots or failing to maintain light emission.

Shibata-Onitsuka discloses an EL layer made of N,N'-Diphenyl-N,N'-di(α-naphthyl)benzidine (see '451, Col. 5, lines 21-22) with a thickness of 20 nm (see '451, Col. 4, line 60) and a transparent electrode made of ITO (see '451, Col. 4, lines 62-63). Shibata-Onitsuka is silent regarding the index of refraction of the EL layer and the thickness of the transparent electrode.

However, Codama discloses an EL device with a transparent electrode made of ITO with a thickness of 10-500 nm, and especially about 30-300 nm, and teaches that too thick electrodes can give rise to problems including peeling, poor workability, stress failure, low light transmittance and leakage due to surface roughness. Further, Codama teaches that too thin electrode is undesirable in film strength during manufacture, hole transporting capabilities and electric resistance (see '078, Col. 12, lines 25-34). In the same field of endeavor, Arai discloses an EL device with an organic light-emitting layer and teaches that organic EL layers usually have a refractive index of about 1.6-1.8, with an average of 1.7 (see '110, Col. 2, lines 40-42) and further teaches that with such an index of refraction, mass production of EL devices with fluctuations in light emission luminance from device to device is reduced, avoiding use of additional equipment for luminance control which provides a decrease in cost of the product and an increase in production efficiency (see '110, Col. 1, lines 30-42, 55-56, 62-67; and Col. 2, lines

1-16). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use Codama's teachings of providing a transparent electrode made of ITO with a thickness of 10-500 nm (30-300 nm); and Arai's teachings of an organic EL layer with an index of refraction of 1.6-1.8 (1.7), with the purpose of (1) avoiding problems including peeling, poor workability, stress failure, low light transmittance and leakage due to surface roughness, undesirable film strength during manufacture, hole transporting capabilities and electric resistance of the transparent electrode; and (2) reducing fluctuations in light emission luminance from device to device in mass production, avoiding use of additional equipment for luminance control which provides a decrease in cost of the product and an increase in production efficiency.

Shibata-Onitsuka in view of Codama-Arai discloses an EL layer and a transparent electrode having a film thickness in which there is no occurrence of guided light and wherein a light generated in said EL layer is emitted to the cover material side.

Regarding claim 6, Shibata-Onitsuka-Codama-Arai discloses an EL device wherein the thickness (d) of the EL layer and transparent electrode satisfies a formula $d \leq \lambda/(4n)$ when a light with a wavelength "λ" generated by the EL layer passes through a medium with a refractive index "n". The Examiner notes that the claim does not make reference to a particular wavelength; accordingly, any wavelength can exemplify the claimed wavelength. Shibata-Onitsuka-Codama-Arai teaches the EL layer with [n=1.7] (see '110, Col. 2, lines 40-42) and the transparent electrode made of ITO [n=1.95] (see '451, Col. 4, lines 62-63). The preferred thickness of the EL layer is 20 nm (see '451, Col. 4, line 60) and that of the transparent electrode ranges from 30-300 nm (see '078 Col. 12, line 27). The disclosed thickness values satisfy the

claimed thickness equation (where d≤ 103 nm for n=1.7 and d≤ 90 nm for ITO, for a wavelength in the red spectrum of 700 nm).

Referring to claim 7, Shibata-Onitsuka-Codama-Arai discloses a light-emitting device having a pixel portion comprising a semiconductor device and an EL element electrically connected to the semiconductor device formed on a substrate (see '451, Fig. 5 and Col. 3, lines 33-38), said EL element comprising:

an opaque electrode **22**; an EL layer **23** over the opaque electrode; and a transparent electrode **24** over the EL layer; an inert gas fills a space between the transparent electrode and a cover material (see '167, Fig. 1); a buffer layer provided between said light-emitting layer and said transparent electrode or between said light-emitting layer and said opaque electrode (see '451 Fig. 5 in view of Fig. 6), wherein each of said EL layer **23** and said transparent electrode **24** has a film thickness in which there is no occurrence of a guided light. Shibata-Onitsuka in view of Codama-Arai discloses an EL layer wherein a light generated in said EL layer is emitted to the cover material side. Same reasons for combining stated in claim 5 apply.

Referring to claim 9, Shibata-Onitsuka-Codama-Arai discloses a light-emitting device having a pixel portion comprising:

a plurality of opaque electrodes **22** arranged in stripe shapes over a substrate (see '451, Fig. 9); an EL layer **23** over the plurality of opaque electrodes; a plurality of transparent electrodes **24** (see '451, Fig. 9 in view of Fig. 8) over the EL layer, the plurality of transparent electrodes provided in stripe shapes so as to be orthogonal to the plurality of opaque electrodes; and an inert gas fills a space between the transparent electrode and a cover material (see '167, Fig. 1), wherein each of said EL layer **23** and said transparent electrode **24** has a film thickness in

which there is no occurrence of a guided light. Shibata-Onitsuka in view of Codama-Arai discloses an EL layer wherein a light generated in said EL layer is emitted to the cover material side. Same reasons for combining stated in claim 5 apply.

Regarding claim 11, Shibata-Onitsuka-Codama-Arai discloses a light-emitting device having a pixel portion comprising:

a plurality of opaque electrodes **22** arranged in stripe shapes over a substrate (see '451, Fig. 9); an EL layer **23** over the plurality of opaque electrodes; a plurality of transparent electrodes **24** (see '451, Fig. 9 in view of Fig. 8) over the EL layer, the plurality of transparent electrodes provided in stripe shapes so as to be orthogonal to the plurality of opaque electrodes; and an inert gas fills a space between the transparent electrode and a cover material (see '167, Fig. 1), a buffer layer provided between said light-emitting layer and said transparent electrode or between said light-emitting layer and said opaque electrode (see '451 Fig. 5 in view of Fig. 6), wherein each of said EL layer **23** and said transparent electrode **24** has a film thickness in which there is no occurrence of a guided light. Shibata-Onitsuka in view of Codama-Arai discloses an EL layer wherein a light generated in said EL layer is emitted to the cover material side. Same reasons for combining stated in claim 5 apply.

Regarding claims 8, 10 and 12, claims 8, 10 and 12 are rejected over the reasons stated in the rejection of claim 6.

Response to Arguments

5. Applicant's arguments filed January 21, 2004 have been fully considered but they are not persuasive.

Applicant requests the Examiner to reconsider the arguments previously made by the applicant.

The Examiner has reconsidered the previously presented arguments and remarks, however, it is the Examiner's position that these arguments had been addressed and the properness of the rejection was established.

Applicant argues that none of the references disclose or suggest the idea of adjusting the film thickness of the EL layer and the transparent electrode, and that even if the combination meets the formula: $d \leq \lambda/4n$, this does not contemplate the concept that light loss is prevented.

The Examiner notes that the combined references disclose an EL device having an EL layer and a transparent electrode wherein each of them has a film thickness that satisfy the aforementioned formula. The Examiner concedes that the references do not specifically state the desired thickness is intended for suppressing waveguided light, however, it is elementary that mere recitation of a newly discovered function or property, inherently possessed by the structure of the prior art, does not cause a claim drawn to distinguish over the prior art. Additionally, where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on. Thus, the functional limitation of each of the EL layer and transparent electrode has a film thickness in which there is no occurrence of a guided light, i.e. light loss being prevented, is taught by the cited references under the principles of functional inherency.

For the reasons stated above, the rejection of claims 1-12 is deemed proper.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to German Colón whose telephone number is 571-272-2451. The examiner can normally be reached on Monday thru Thursday, from 8:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on 571-272-2457. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

gc

ASHOK PATEL
PRIMARY EXAMINER